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CASE REPORT

Platypnea-orthodeoxia syndrome following left pneumonectomy for early stage non-small cell lung cancer ☆

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Pneumonectomy;
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Abstract
Introduction: Lobectomy or pneumonectomy represents the treatment of choice for resectable early stage non-small cell lung cancer (NSCLC). The location of heart and great vessels, liver and spleen changes considerably following pneumonectomy as a consequence of mediastinal shift and elevation of the hemidiaphragm.
Presentation of case: A 70 years old gentleman developed acute shortness of breath two months after undergoing a left pneumonectomy for a pT2pN1M0 NSCLC, squamous cell carcinoma. His dyspnea and oxygen saturation worsened when sitting upright and immediately improved when he assumed the supine position, consistent with platypnea-orthodeoxia syndrome, and suggesting a potential inter-atrial right-to-left shunt. The presence of a patent foramen ovale (PFO) was documented by transoesophageal echocardiography. The patient underwent percutaneous closure of the PFO which markedly reduced the shunt, and led to resolution of symptoms.

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Discussion: PFO is a common anomaly, found in approximately 25% of adults. Its presence is associated with increased risk of stroke from paradoxical emboli. Inter-atrial shunting after major thoracic surgery is a rare but clinically significant event. The case here reported was diagnosed following left pneumonectomy and to our knowledge, only two other single cases of PFO after left pneumonectomy have been reported in the literature so far.
Conclusion: A PFO should always be considered in the differentials for patients presenting with platypnea-orthodeoxia syndrome after lung surgery. Given the high risk of embolic stroke and high success rate of transcatheter percutaneous closure, these patients should be promptly referred for cardiac investigations and appropriate management.

1. Introduction

Lobectomy or pneumonectomy represents the treatment of choice for resectable early stage non-small cell lung cancer (NSCLC). The location of heart and great vessels, liver and spleen changes considerably following pneumonectomy as a consequence of mediastinal shift and elevation of the hemidiaphragm. Early mortality rate is higher with right-sided pneumonectomy than left-side pneumonectomy (10-12% vs. 1-3.5%) [1,2]. An unusual complication of pneumonectomy is intra-cardiac right-to-left shunting due to a patent foramen ovale (PFO) or an atrial septal defect. Herein, we report a case of a patient with PFO diagnosed after left pneumonectomy for early stage NSCLC.

2. Presentation of case

A 70 years old gentleman underwent a left pneumonectomy in Aug 2012, for a pT2pN1M0 non-small cell lung cancer (NSCLC), squamous cell carcinoma. His postoperative period was complicated by an asystolic cardiac arrest and he was successfully resuscitated. Further investigations showed a normal 24 h rhythm tape and ruled out a myocardial infarction. A stress echocardiography showed normal left ventricle ejection fraction (LVEF) and no evidence of stress-induced ischemia. His past medical history included only bilateral hearing loss.

He received his first cycle of adjuvant chemotherapy with carboplatin area-under-the-curve (AUC) 5 on day 1 and vinorelbine 25 mg/m^2 on day 1-8, given every 21 days, in October 2012. When he attended for his cycle 1 day 8 vinorelbine infusion, he was complaining of five days' history of shortness of breath when mobilizing. His chemotherapy was omitted and was admitted to the oncology ward. On admission he was normopneuic, with normal blood pressure (BP), heart rate and temperature. His oxygen saturation ($SatO_2$) in room air was 85% and physical examination showed only signs of previous left pneumonectomy. Blood tests were within normal limits. A chest x-ray showed only signs of left pneumonectomy and ECG was unremarkable.

In the evening, his dyspnea suddenly deteriorated and his oxygen flow was increased up to 100% FiO_2. An arterial blood gas analysis (ABG) showed Ph 7.39 (normal range 7.34-7.44), $PaCO_2$ 3.5 kPa (normal range 4.7-6.0), PaO_2 6.2 kPa (normal range 11-13), BE −7.3 mmol/l (normal range −2/+2) and Bicarbonate 18.7 mmol/l (normal range 22-26) and $SatO_2$ 90%.

A CT pulmonary angiogram ruled out pulmonary emboli or recurrent disease but showed subtle increase in the density of upper right lung, possibly representing pneumonitis. He was started on Hydrocortisone 200 mg IV and Oseltamivir 75 mg BD per os. Subsequent ABG on 100% oxygen showed Ph 7.46, $PaCO_2$ 3.6 KPa, PaO_2 17.5 kPa, BE −3.2 mmol/l and Bicarbonates 22.4 mmol/l. The dyspnea improved overnight and the hydrocortisone was changed to 100 mg IV every eight hours. During the following days of admission he became more dyspneic and was noticed that his dyspnea and oxygen saturation worsened when sitting upright and immediately improved when he assumed the supine position (platypnea-orthodeoxia syndrome) suggesting a potential inter-atrial right-to-left shunt. A transthoracic echocardiography showed a moderate pericardial effusion (1.5 cm thickness) around the posterior wall but no hemodynamic compromise and normal left ventricular function. A bubble-contrast echocardiography confirmed a large right-to-left shunt and a subsequent transoesophageal echocardiogram demonstrated anatomy distorted as expected, with heart dislocated to the left with obvious PFO and persistent right-to-left shunt. The patient underwent percutaneous closure of the PFO, which markedly reduced the shunt. After the procedure, the dyspnea completely resolved and patient's $SatO_2$ on discharge was 99% in room air. The patient is now currently well and in follow-up.

3. Discussion

PFO is a common anomaly, found in approximately 25% of adults [3]. Its presence is associated with the increased risk of stroke from paradoxical emboli.

Inter-atrial shunting after major thoracic surgery is a rare but clinically significant event. The case here reported was diagnosed following left pneumonectomy and to our knowledge, only two other single cases of PFO after left pneumonectomy have been reported in the literature so far [4,5].

The vast majority of case reports describe this syndrome as a complication following right pneumonectomy [6-14].

Ng and colleagues reported a single-institution retrospective analysis of 581 patients who underwent pneumonectomy, or pleurectomy from 2005 to 2009 at Brigham and Women's Hospital in Boston, USA [9]. Eight cases (incidence of 1.4%) of postoperative interatrial shunt were identified and seven (87.5%) occurred after right-sided surgery. Median time to presentation was 14 days (range 2-42) after surgery. Most common symptoms at presentation were

dyspnea and platypnea-orthodeoxia syndrome. Notably, two patients presented with neurologic complications secondary to paradoxical embolism. Only two patients required intervention, whilst for the remainder symptom resolved with conservative management. Bakris et al. reported on 4 patients with platypnea and orthodeoxia after pneumonectomy [8]. All the patients developed right-to left interatrial shunt due to PFO following right pneumonectomy. Dyspnea developed between 4 months and a year since surgery and all patients underwent closure of the PFO with resolution of symptoms.

4. Conclusion

Right-to-left atrial shunt from PFO is not unusual in patients who have undergone pneumonectomy, most commonly on the right side. This can occur from the immediate postoperative period to up to one year after surgery. Given the low incidence of this complication, perioperative screening for PFO and atrial septal defect (ASD) is not recommended. On the other hand, a PFO/ASD should always be considered in the differentials for patients presenting with platypnea-orthodeoxia syndrome after lung surgery. Given the high risk of embolic stroke and high success rate of transcatheter percutaneous closure, these patients should be promptly referred for cardiac investigations and appropriate management.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the editor-in-chief of this journal upon request.

Conflict of interest statement

None declared.

Role of funding source

None.

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